The Center for Mathematics and Scientific Computation (CMSC)

and

The Caesarea Rothschild Institute (CRI) for Interdisciplinary Applications of Computer Science

Cordially invite you to

A one-day marathon on

"Projection Methods in Feasibility, Superiorization and Optimization"

Thursday, December 19, 2013

The event is under the joint auspices of the **Center for Mathematics and Scientific Computation (CMSC)** and the **Caesarea Rothschild Institute (CRI) for Interdisciplinary Applications of Computer Science** at the University of Haifa, and is organized by Yair Censor.

The talks will be given at the University of Haifa, in the Abraham and Rachel Kluger Education and Sciences Building, 6th Floor, Room number 665, according to the following program. Talks' titles, Speakers' names, and Abstracts are provided below.

Participation is free but let us please know in advance if you intend to come via the following contact information.

For entrance and parking permit to the campus please write to: Ms. Danielle Friedlander, Administrative Coordinator, the CRI, Phones: 04-8288337 (office), 050-9777907 (cell), e-mail: dfridl1@univ.haifa.ac.il

For all other questions please contact: Prof. Yair Censor, Phones: 04-8240837 (office), 050-8816144 (cell), e-mail: yair@math.haifa.ac.il

Program

08:45 -- 9:00 Getting together

09:00 -- 09:05 Yair Censor: Opening comments

09:05 -- 10:00 Andrzej Cegielski: Methods for the split common fixed point problem

10:00 -- 10:30 Coffee break

10:30 -- 11:30 Simeon Reich: Porosity and the bounded linear regularity property

11:30 -- 12:30 Ran Davidi: Superiorization of projection methods and their use in medical applications

12:30 -- 14:00 Lunch break

14:00 -- 15:00 Aviv Gibali: projection-based scheme for solving convex constrained optimization problems

15:00 -- 16:00 Rafiq Mansour: The cyclic Douglas-Rachford algorithm

16:00 -- 16:30 Open forum and closing of the meeting

Titles, Speakers (in alphabetical order) and Abstracts:

Title: Methods for the split common fixed point problem

Speaker: Andrzej Cegielski, University of Zielona Gora, Poland

Abstract: We present a general method for solving a split common fixed point problem in Hilbert spaces, with an application of strongly quasi-nonexpansive operators satisfying the demi closedness principle. We present a general convergence theorem and show that the known methods satisfy the assumptions of this theorem.

Title: Superiorization of projection methods and their use in medical applications

Speaker: Ran Davidi, Stanford University, California, USA

Abstract: Computationally demanding numerical minimization techniques are often used in medical applications such as radiation therapy treatment planning and computerized tomography. They often employ cost functions and corresponding solution approaches that are not necessarily most appropriate for achieving the desired solutions. This disconnect occurs because minimal solutions to current cost function formulations are not guaranteed to provide the optimal solution from the point of view of the application. Therefore, the considerable computational cost associated with some of these minimization techniques may not be justified. Superiorization is a new paradigm that substantially improves computational tractability by producing a solution with reduced, but not necessarily minimal, value of a defined cost function that is guaranteed to satisfy the constraints of the problem. The ability to do so stems from the fact that many feasibility-seeking projection methods are perturbation-resilient which enables to steer the process to a solution with a reduced (i.e., superior) cost function value. In this talk we present how superiorization can be applied to real-world applications and demonstrate its usefulness with a few examples taken from the medical field.

Title: projection-based scheme for solving convex constrained optimization problems

Speaker: Aviv Gibali, Fraunhofer Institute for Industrial Mathematics (ITWM), Kaiserslautern, Germany

Abstract: In this talk we present a new projection-based scheme for general convex constrained optimization problem. The general idea is to transform the original optimization problem to a sequence of feasibility problems by iteratively constraining the objective function from above until the feasibility problem is inconsistent. Then, for each of the feasibility problems one may apply any of the existing projection methods for solving it, which are known to be very efficient and practical. Some numerical experiments to illustrate the performance of the suggested scheme.

Title: The cyclic Douglas-Rachford algorithm

Speaker: Rafiq Mansour, University of Haifa, Israel

Abstract: The Douglas-Rachford (DR) algorithm is a projection method for finding the projection of a point onto the nonempty intersection of two sets. It draws great attention in the literature recently. We review recent results on the cyclic Douglas-Rachford algorithm which extends the DR algorithm to handle a family of n sets. Our presentation is based on a recent paper on this topic by J.M. Borwein and M.K. Tam.

Title: Porosity and the bounded linear regularity property

Speaker: Simeon Reich, The Technion, Israel

Abstract: H. H. Bauschke and J. M. Borwein showed that in the space of all tuples of bounded, closed and convex subsets of a Hilbert space with a nonempty intersection, a typical tuple has the bounded linear regularity property. This property is important because it leads to the convergence of infinite products of the corresponding nearest point projections to a point in the intersection. We show that the subset of all tuples possessing the bounded linear regularity property has a porous complement. Moreover, our result is established in all normed spaces and for tuples of closed and convex sets which are not necessarily bounded.

This is joint work with A. J. Zaslavski.